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MAMMALIAN TOXICOLOGY TESTING: PROBLEM DEFINITION STUDY, PERSONNEL--ETC(U)

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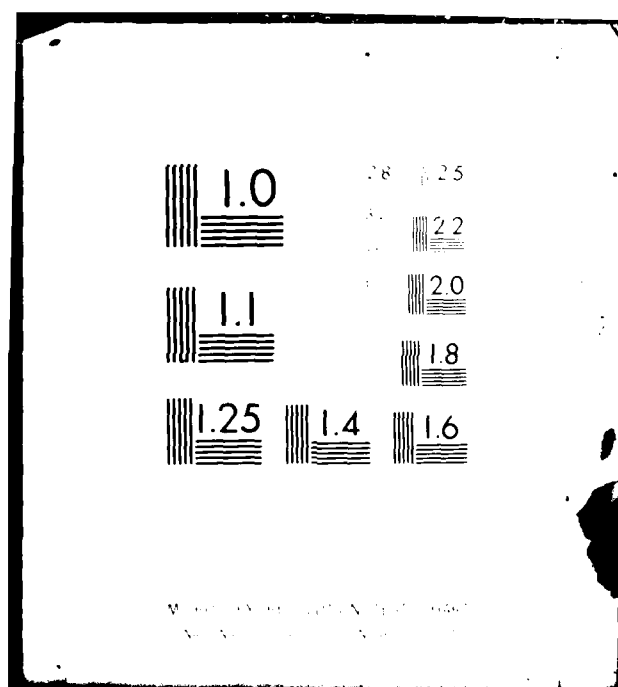
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MAMMALIAN TOXICOLOGY TESTING: PROBLEM DEFINITION STUDY

PERSONNEL PLAN (U)

by
R. H. Reuter

March, 1981

Supported by

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND
Fort Detrick, Frederick, Maryland 21701

Contract DAMD17-81-C-1013

Life Systems, Inc.
Cleveland, OH 44122

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Plans for assembling all categories of personnel required for the operation and management of an Applied Mammalian Toxicology/Research Facility are summarized in this report. The plans were subdivided into the Person-power Plan, the Recruitment Plan and the Personnel Development Plan. It accumulates the information relating to personnel required for an Army Toxicology Facility in one report.		

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Report SubtitleLife Systems, Inc.
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Final Reports--

Part 1. Comparative Analysis Report
 Part 2. Facility Installation Report
 Part 3. Impact of Future Changes Report

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FOREWORD

Reports for this Contract, DAMD17-81-C-1013, consist of three major final reports and twelve supporting documents. The Contract title, MAMMALIAN TOXICOLOGY TESTING: PROBLEM DEFINITION STUDY, is the main title for all the reports. Individual reports are subtitled and referenced with Life Systems, Inc. report numbers as detailed below. Please note that the Life Systems report numbers in test references are shortened. In the Defense Technical Information Center (DTIC) data base the reports are identified by the complete report numbers (i.e., LSI-TR-477-XXX) and complete numbers must be used for retrieval.

<u>Report Subtitle</u>	<u>Life Systems, Inc. Report Number</u>
Final Reports--	
Part 1. Comparative Analysis Report	LSI-TR-477-2
Part 2. Facility Installation Report	LSI-TR-477-3
Part 3. Impact of Future Changes Report	LSI-TR-477-4
Supporting Documents--	
Technology Changes Impact on Testing Requirements	LSI-TR-477-14
Quality Assurance Plan	LSI-TR-477-17A
Capability Modules	LSI-TR-477-19B
Technical Plan	LSI-TR-477-20A
Equipment Plan	LSI-TR-477-21A
Personnel Plan	LSI-TR-477-23A
Inhalation Chambers and Supporting Equipment Survey	LSI-TR-477-26A
Equipment List for Modules	LSI-TR-477-28B
AMTR Protocol/Pricing Report	LSI-TR-477-29A
Global Army Toxicology Requirements	LSI-TR-477-31A
Comparison Toxicology Test Costs	LSI-TR-477-36A
Annual Testing Capacity	LSI-TR-477-38A

SUMMARY

The Personnel Plan was developed for a contractor-operated Applied Mammalian Toxicology Research/Testing Facility located in the San Francisco Bay area. The Plan, however, has general applicability to locations in other areas that have toxicology capabilities.

The Personnel Plan was subdivided into a Person Power Plan, a Recruitment Plan and a Personnel Development Plan. It was clearly recognized that an outstanding personnel team can overcome many other Facility's shortcomings. Further, a key to team building is developing a good Personnel Plan, implementing it and upgrading it as events require.

The approach used was to address person-power from an organizational concept. This allowed meeting the personnel requirements for a modular concept Facility that can perform all the various tests projected as potentially of interest to the Army. It addressed such key factors as national supply of and demand for key personnel and local factors affecting recruitment. A time schedule was given.

The Person-Power Plan covered organization, personnel descriptions/titles and personnel requirement.

The Recruitment Plan covered personnel recruitment and start-up factors, forecast of supply and demand of key personnel such as: aerosol chemist, pharmacodynamists, etc. It was recognized that veterinarian pathologists are, and for their foreseeable future will be, in short supply. Techniques were cited for competing for scarce personnel resources including such techniques as compensation, attractive location, professional environment and offering training time for the personnel. Special emphasis was given to the San Francisco Bay area because of its attractiveness as a location for a professional toxicology facility.

The Personnel Development Plan covered compensation policy and analysis, techniques for utilizing personnel in short supply and applicability of U.S. and California Laws.

The ratio of government personnel to total personnel was included for the case that the Facility was to be operated as a Government-owned, contractor-operated operation.

It was concluded a Comprehensive Personnel Plan is vital to the establishment and maintenance of a high-quality Facility. Personnel represent a critical resource that will limit the Facility's capabilities.

FOREWORD

This report was prepared by Life Systems, Inc. (LSI) under Task 7 of U.S. Army Contract DAMD-17-81-C-1013. The effort was completed under the overall direction of Dr. Richard A. Wynveen, Principal Investigator. Dr. Roy H. Reuter served as the Task Manager. The final report was prepared and assembled by Dr. Roy H. Reuter, Mr. Brad Geier, Ms. Judy Huret, Dr. Joel Lantz and Mr. Richard Albans.

Col. Alfred Allen served as the Contract Officer's Technical Representative for the Letterman Army Institute of Research (LAIR).

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LIST OF ACRONYMS

ACVP	American College of Veterinary Pathologists
AMTR	Applied Mammalian Toxicology Research
GOCO	Government owned Contractor operated
GOGO	Government owned Government operated
NIEHS	Natitute of Environmental Health Sciences
RCRA	Resource Conversation and Recovery Act
SOP	Standard Operating Procedure
TPF&C	Towers, Perrin, Forster & Crosby
TSCA	Toxic Substances Control Act
UC	University of California

INTRODUCTION

The purpose of this document is to provide a Personnel Plan for a contractor operated Applied Mammalian Toxicology Research (AMTR) facility located in the San Francisco Bay Area. The Plan will have general applicability to AMTR facilities located in other areas that have full service or specialized toxicology capabilities. The Plan will accommodate growth and change. It covers all categories of personnel required for the operation and management of the AMTR facility. It anticipates Contractor operation of a Government owned facility with an on-site staff of Government personnel providing technical mentorship and contract administration.

Background

The Personnel Plan includes three sub-plans: the Personpower Plan, the Recruitment Plan and the Personnel Development Plan. These sub-plans are closely interrelated and interdependent. An outstanding personnel team can overcome many other facility shortcomings. A key to team building is developing a good Personnel Plan, implementing it and upgrading it as events require.

Scope of Plan

The Personnel Plan was conceived and prepared to accumulate all of the information relating to personnel required for the Army's AMTR facility in one spot. It includes:

1. Identification of the types of personnel required
2. A forecast of the supply and demand of key personnel
3. Recommendations for the Government management staff
4. A list of potential conflicts between Federal Service, Uniformed Service and Contractor personnel
5. An organization configuration for the activity
6. Improved techniques for utilization of veterinary pathologists
7. Competition for scarce personnel resources
8. Compensation policy and analysis
9. Applicable US Government and California laws affecting personnel activities
10. Relocation assistance and relocation decision factors
11. Comparative cost of living and salary information for San Francisco and other selected metropolitan areas.

Approach

The approach used in performing this task was to address person-power from an organizational concept. This was done so as to meet the personnel requirements for a modular concept AMTR facility that can perform all of the various tests projected as potentially of interest to the Army. The recruitment plan addressed national supply of and demand for key personnel and local factors affecting recruitment.

Personnel development considered both personnel management and compensation policies to enable the facility to recruit and retain personnel at all levels.

Assumptions

The assumptions listed below were made to facilitate preparation of the Personnel Plan:

1. THE AMTR facility will be located in San Francisco.
2. The AMTR facility will be Contractor operated.
3. Government staffing will be minimized consistent with fulfilling government responsibilities set out in regulations.
4. There may be Federal Service employees (not part of the Government Management staff) within the facility.
5. The Personnel Plan will cover all of the types of AMTR testing projected as potentially needed by the Army.
6. The facility will perform high quality toxicology testing that will be acceptable for scientific publication and regulatory compliance and will withstand court scrutiny.
7. The Contractor will not be required to meet Government personnel policies that apply to Federal Service employees, but will be able to co-exist with a Government Owned Government Operated (GOGO) activity.
8. Technician-grade, clerical and non-managerial level administrative staff will be local hires.
9. Professional, middle and senior management will be recruited on a national basis.
10. The AMTR facility will have a start-up phase, during which the types of testing and the amount of testing will increase according to a planned schedule.
11. The Contractor will utilize its existing personnel development policy and recruitment strategy as a starting point but tailor it to the specific situations and conditions of the AMTR facility.

Schedule

The schedule for the Personnel Plan is depicted in Figure 1. Notification of contract award is the starting point for Personnel Plan activities unique to the AMTR facility. The details of the contract and the level and amount of prior planning by the Army will have a major effect on the Personnel Plan schedule. The amount of time required for approvals by the Government's Contracting Officer will also impact the schedule, as will local, regional and national economic/employment conditions. Government support of toxicology research testing and training programs will impact the availability of personnel and affect recruitment, particularly of experienced professionals.

PERSONPOWER PLAN

Organization

Figure 2 depicts the proposed organization for an AMTR facility capable of performing any and all of the toxicology testing projected to be required by the Army, consistent with the study's Statement of Work. The organization is discussed more fully in the Technical Plan and the Management Plan. Noteworthy from a Personnel Plan perspective, however, are the major divisions/offices and the relationship between the support services and toxicology research/testing. The Personnel Plan considers the personnel requirements to fully staff the organization.

AMTR Personnel Descriptions/Titles

Table 1 provides a list of the personnel titles expected to be required for an AMTR facility, showing labor categories and certifications. Brief descriptions for a group of selected personnel titles are provided in Appendix I, including a statement of the education and experience level required for each position listed.

Personnel Requirements

The projected personnel requirements for each module in an AMTR facility are enumerated in Table 2 by type, using the organizational configuration depicted in Figure 2. The number of personnel of each type required for a particular AMTR facility will be a function of the testing through-put and types of testing performed in the facility.

RECRUITMENT PLAN

Personnel Recruitment and Startup

Figure 3 indicates the steps involved in personnel recruitment and the relative ratios between the five steps (leads, invites, interviews, offers and hires). The overall ratio from personnel leads to hires is 24 to 1. Stated another way, 2,400 leads are required to hire 100 personnel. Figure 4 depicts the time required for each step in a hiring process for 500 employees. This

FIGURE 1 SCHEDULE FOR IMPLEMENTING THE PERSONNEL PLAN

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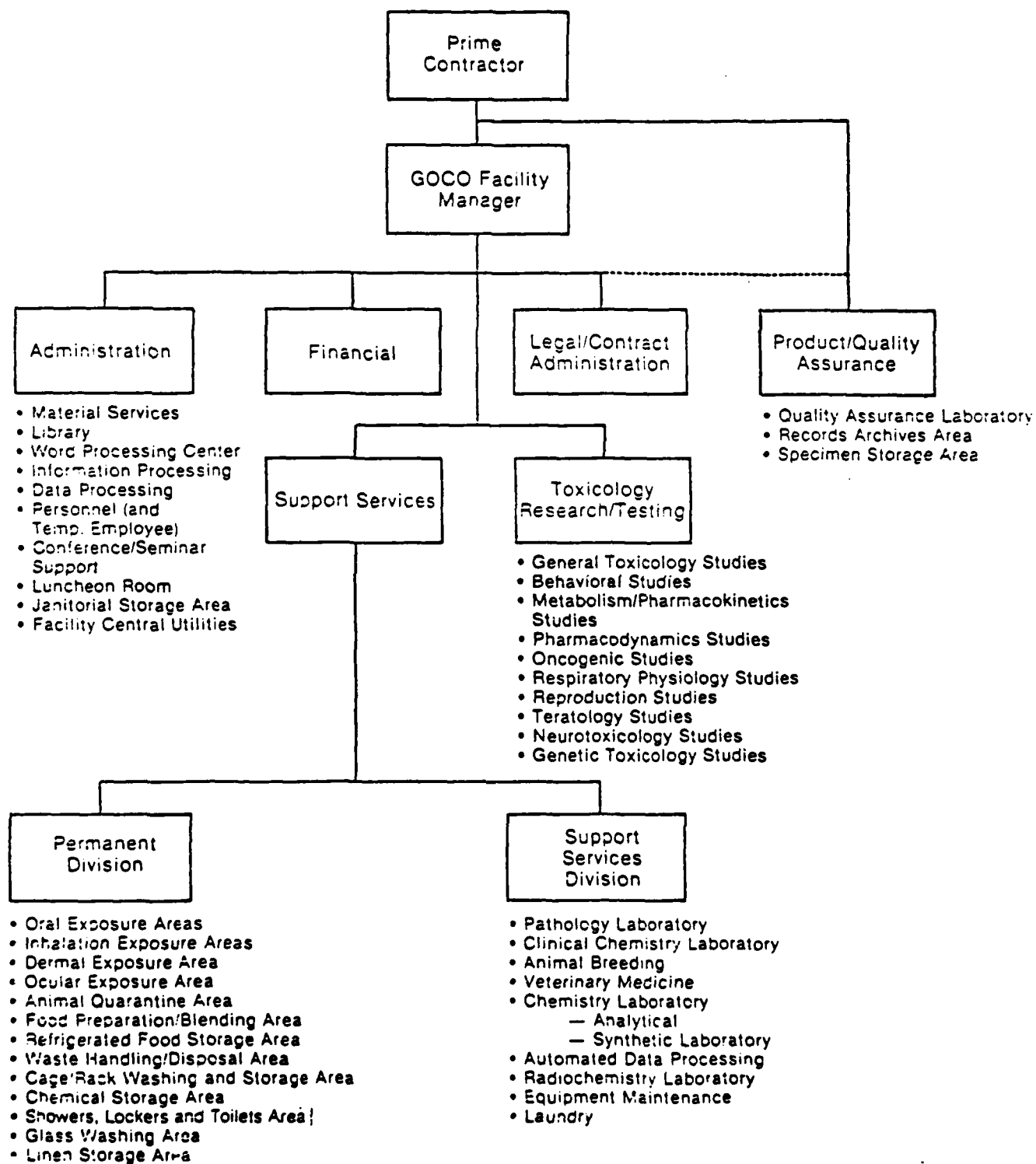


FIGURE 2 ORGANIZATIONAL LOCATION OF FACILITY LABS AND AREAS

TABLE 1
AMTR PERSONNEL TITLES

Title	Category			Special Certification(s)
	Professional	Technical Technician	Management & Administration	
Administrative Clerk			X	
*Aerosol Chemist	X			
Analytical Chemist	X			
Animal Caretaker		X		
Animal Technician		X		X
Biochemist	X			
Biologist	X			
Bookkeeper			X	
Cage Washer		X		
Clinical Chemist	X			
Compound Preparation Technician		X		
Computer Coder			X	
Computer Programmer			X	
Electron Microscope Operator	X			
Facility General Manager			X	
Histology Supervisor	X			
Histology Technician		X		
HVAC Engineer	X			
*Immunologist	X			X
Industrial Hygienist	X			X
Information Specialist	X			
Instrument Operator		X		
Keypunch Operator			X	
Laboratory Technician		X		
Literature Review Specialist		X		
Maintenance Personnel		X		
Necropsy Supervisor	X			
Necropsy Technician		X		
Occupational Physician	X			X
Organic Chemist	X			
Personnel Officer			X	
*Pharmacodynamicist	X			X
*Pharmacokineticist	X			X
*Pharmacologist	X			X
Pharmacology Chemist	X			X
Physiologist	X			X
Purchasing Agent			X	
Quality Assurance Officer	X			
Radiological Health Officer	X			X
Secretary			X	
Statistician	X			
Supply Clerk			X	
Technical Editor			X	
Test Manager	X			
*Toxicologist	X			X
a. Behavioral	X			X
b. General	X			X
c. Metabolist	X			X
d. Mutagenesist	X			X
e. Neurotoxicologist	X			X
f. Oncologist	X			X
g. Pulmonary	X			X
h. Teratologist	X			X
Toxicology Program Manager			X	
Training Officer			X	
Typist			X	
Veterinarian	X			
a. Lab Animal Officer	X			X
*b. Ophthalmologist	X			
*c. Pathologist	X			X

* Means currently and projected to be in short supply.

TABLE 2 PERSONNEL BY AMTR FACILITY/AREA LABORATORY

Personnel Titles	AMTR Facility Areas/Laboratories (a)(b)
Administrative Clerk	60
Aerosol Chemist	5, 6, 7, 8, 9, 10
Analytical Chemist	29, 31
Animal Caretaker	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 27, 28, 61, 63
Animal Technician	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 27, 28, 61, 63
Biochemist	14, 15, 26
Biologist	62
Bookkeeper	60
Cage Washer	33
Clinical Chemist	26
Comp. Prep. Technician	20
Computer Coder	31
Computer Programmer	31
Electron Microscope Op.	25
Facility Gen. Mgr.	60
Histology Tech.	26
Histology Supervisor	26
HVAC Engr.	5, 6, 7, 8, 9, 10
Immunologist	1, 2, 3, 4, 5, 6, 7, 8, 9
Industrial Hygienist	37
Information Specialist	36
Instrument Operator	5, 6, 7, 14, 15, 23, 27, 29, 31
Key punch Operator	30
Lab Technician	13, 14, 15, 16, 17, 18, 19, 23, 26, 29, 31, 36, 61, 62, 63
Lit. Review Specialist	36
Maintenance Personnel	21, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 59
Necropsy Supervisor	1, 2, 5, 6, 8, 9, 11, 12, 25
Necropsy Technician	1, 2, 5, 6, 8, 9, 11, 12, 25
Occupational Physician	37
Organic Chemist	14, 15, 29, 31
Personnel Office	60
Pharmacodynamicist	15
Pharmacokineticist	14
Pharmacologist	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 58, 61, 62, 63
Pharmaceutical Chemist	14, 15
Physiologist	13, 17
Purchasing Agent	60
QA Officer	23

(a) Principal areas where personnel would be expected to perform their work.

(b) Refer to attached AMTR Facility Areas/Laboratories List for definition of area codes.

continued -

Table 2 - continued

<u>Personnel Titles</u>	<u>AMTR Facility Areas/Laboratories</u>
Rad. Health Officer	31, 37
Secretary	37, 60
Statistician	37
Supply Clerk	38
Technical Editor	37
Test Manager	37
Toxicologists	
Behavioral	12
General	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Metabolism	14
Mutagenic	62, 63
Neurotox.	61
Oncogenic	3, 7, 10
Pulmonary	17
Teratology	19
Toxicology Prog. Mgr.	37
Training Officer	37, 60
Veterinarians	
Lab. Animal Off.	24, 27, 28
Ophthalmologist	12
Pathologist	25

continued -

Table 2 - continued

AMTR FACILITY AREAS/LABORATORIES

No.	Title
1.	Acute Oral Exposure Area, Rodent
2.	Subchronic Oral Exposure Area, Rodent
3.	Chronic Oral Exposure Area, Rodent
4.	Subchronic Oral Exposure Area, Dog
5.	Acute Inhalation Exposure Area, Rodent
6.	Subchronic Inhalation Exposure Area, Rodent
7.	Chronic Inhalation Exposure Area, Rodent
8.	Acute Inhalation Exposure Area, Primate
9.	Subchronic Inhalation Exposure Area, Primate
10.	Chronic Inhalation Exposure Area, Primate
11.	Dermal Testing Area, Rabbit
12.	Ocular Testing Area, Rabbit
13.	Behavioral Studies Area
14.	Metabolism Studies Area
15.	Pharmacokinetics/Pharmacodynamics Studies Area
16.	Oncogenic Studies Area
17.	Respiratory Physiology Studies Area
18.	Reproduction Studies Area
19.	Teratology Studies Area
20.	Food Preparation/Blending Area
21.	Non-radioactive Waste Handling/Disposal Area
22.	Refrigerated Food Storage Area
23.	Quality Assurance Laboratory
24.	Animal Quarantine Area
25.	Pathology Laboratory
26.	Clinical Chemistry Laboratory
27.	Animal Breeding Area
28.	Veterinary Medicine Area
29.	Analytical/Synthetic Chemistry Laboratory
30.	Automated Data Processing Area
31.	Radiochemistry Laboratory
32.	Cage/Rack Washing and Storage Area
33.	Chemical Storage Area
34.	Showers, Lockers and Toilets Area
35.	Glassware Washing Area
36.	Library Area
37.	Technical Offices Area
38.	Shipping and Receiving Area
39.	Luncheon Room Area
40.	Record Archives Area
41.	Specimen Storage Area
42.	Linen Storage Area
43.	Janitorial Storage Area
44.	Central Cylinder Gas Storage Area
45.	Equipment Maintenance Area
46.	Laundry Area
47.	Central Power Area

Table 2 - continued

<u>No.</u>	<u>Title</u>
48.	Central Standby (Emergency) Power Area
49.	Central Water Supply Conditioning Area
50.	Central Wastewater Conditioning Area
51.	Central Air Handling Area
52.	Central Heating Area
53.	Central Compressed Air/Vacuum Area
54.	Central Communications Area
55.	Central Refrigeration Area
56.	Central Toilet Area
57.	Central Vacuum Cleaning Area
58.	Dermal Testing Area, Rodent
59.	Central Automated Facility Systems Control Area
60.	Administrative Office Area
61.	Neurotoxicology Studies Area
62.	<u>In Vitro</u> Genetic Toxicology Studies Area
63.	<u>In Vivo</u> Genetic Toxicology Studies Area

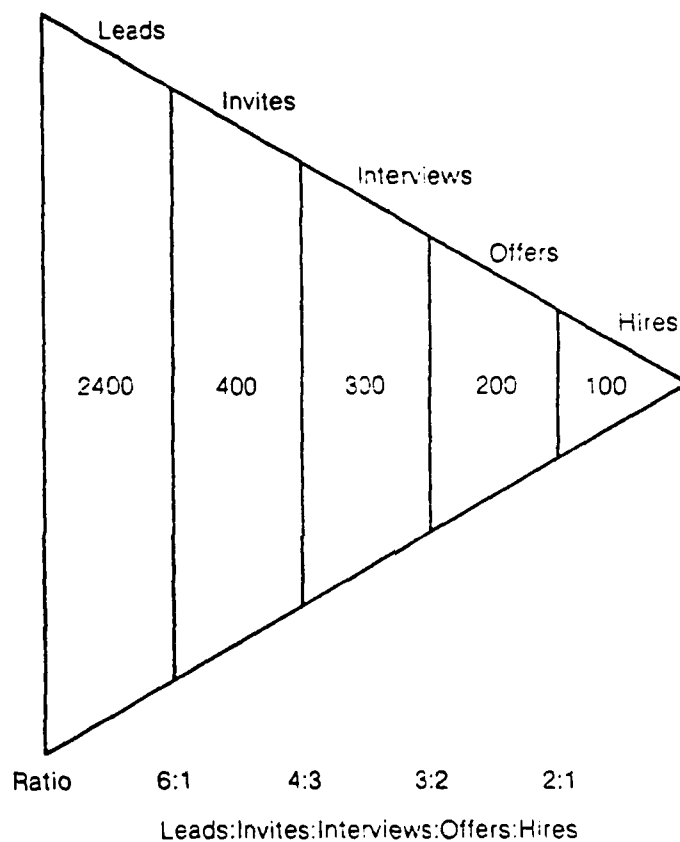


FIGURE 3 PERSONNEL RECRUITMENT STEPS AND RATIOS

information was obtained from a book entitled "The Recruitment Function" (Hawk 1967^(a)). Figure 4 is a series of plots depicting time versus number of personnel data for each step in the recruitment process. Certain modifications can speed up the process slightly, but it is unlikely that 500 hires can be brought on board in much less than six months. It is estimated that approximately five months is needed to hire 100 employees. Therefore, regardless of the exact size of the AMTR facility, five-six months will be needed to staff a moderate to large AMTR facility.

The personnel efforts to perform the functions necessary to hire a person require approximately one person-year of effort for each 50 persons hired. Therefore, a personnel staff of approximately 20 full-time employees would be required to hire 500 persons in six months.

Forecast of Supply and Demand of Key AMTR Personnel

Of the personnel types required for an AMTR facility, the following are considered key personnel likely to be in short supply:

- Aerosol Chemist
- Immunologist
- Pharmacodynamicist
- Pharmacokineticist
- Pharmacologist
- Toxicologist
- Veterinary Pathologist

No single agency, report or professional society provides an adequate estimate of the supply and demand for AMTR personnel on a national, regional or specialized basis. The following discussion addresses the personnel types forecast to be in short supply in three groupings because of the absence of detailed data on specialty sub-disciplines. The discussion addresses the aerosol chemist and the veterinary pathologist separately. The toxicologist/pharmacologist, the immunologist, the pharmacodynamicist and the pharmacokineticist are grouped together under the heading Toxicologist/Pharmacologist.

Aerosol Chemist

The aerosol chemist's involvement in an AMTR facility is critical to certain inhalation toxicology studies. However, no specific data was obtained on the number of trained aerosol chemists because a specific degree or major in this area is not believed to be offered by any US university. The major reason for the scarcity of aerosol chemists is in part due to the lack of higher education training, the attractiveness of other chemistry specialties and the fact that trained aerosol chemists gain their experience through an "on the job training" apprenticeship relationship with a senior scientist.

^(a) References are cited at end of Report.

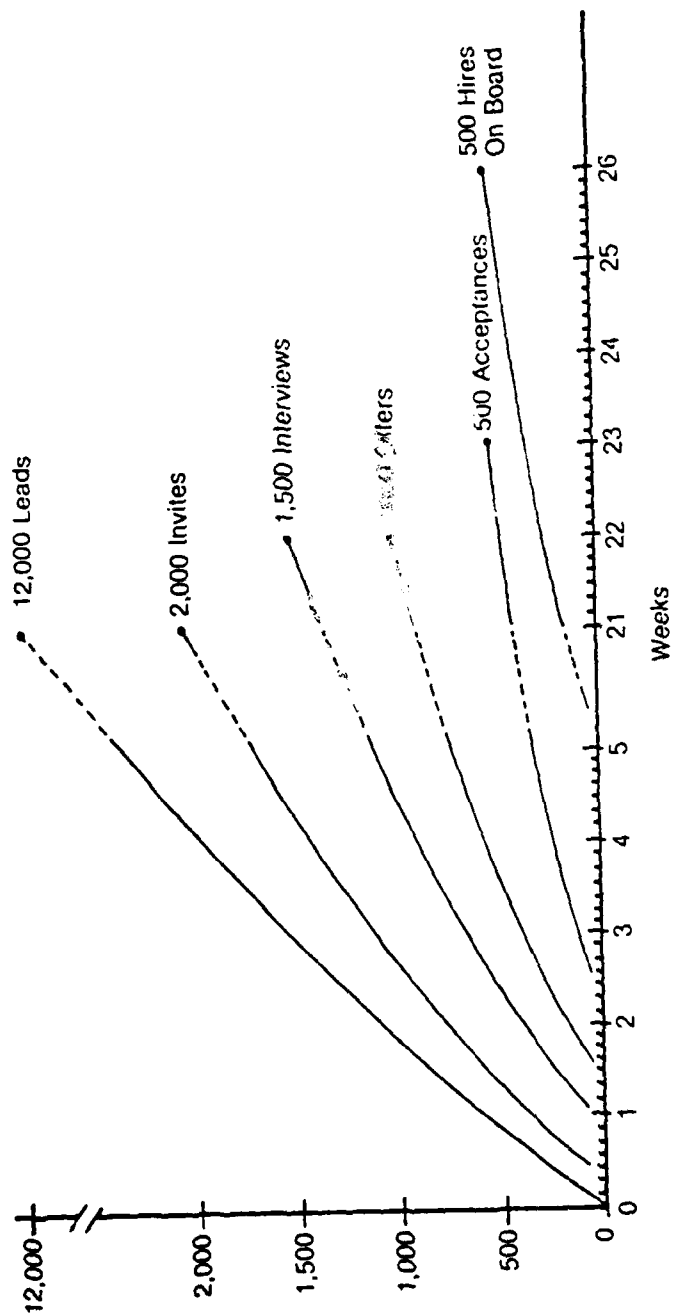


FIGURE 4 RECRUITMENT SCHEDULE

Postdoctoral training of chemists with physical chemistry backgrounds in AMTR facilities provides the best mechanism for increasing the supply of aerosol chemists. Currently aerosol chemists are working in air pollution and selected industrial positions, as well as in inhalation toxicology. No major increase in demand is forecast.

The San Francisco area represents one of the few areas in the world with a relatively large number of aerosol chemists. This center of excellence was built over many years through a relationship between UC-Berkeley and the US Navy. These personnel are approaching retirement age but could provide an excellent advisory or mentor role for a physical chemist to become knowledgeable in aerosol chemistry.

Toxicologist/Pharmacologist

In a report entitled, "Training Scientists for Future Toxic Substances Problems, Report of a Workshop Sponsored by the National Institute of Environmental Health Sciences, the Chemical Industry Institute of Toxicology, the Conservation Foundation and the Environmental Protection Agency" (Conservation Foundation 1978) it was estimated that there are approximately 2,700 senior toxicologists and a total of 5,000 toxicologists in the US. The report projects an immediate need for between 900 and 1,300 additional toxicologists, based upon projected industrial and government requirements to meet TSCA and RCRA regulations. In addition, 200 more such individuals per year are required to offset attrition through retirement, career changes and death. By comparison, the estimate of toxicologists entering the field annually from university programs is between 135 and 150. Therefore, these projections indicate that the scarcity of toxicologists, particularly senior toxicologists, is becoming more critical with time. The Federal Government traineeship programs (through NIEHS) are expected to increase the annual output of toxicologists from university training to about 200. This program undergoes budget review annually, and therefore its continuation and level of support is uncertain.

A program entitled, "The Academic Investigator Award in Toxicology", also supported by NIEHS, retrains scientists from ancillary fields for up to three years to enable them to perform as toxicologists. This program, as currently funded, will provide an additional 25 toxicologists annually.

The NIEHS currently has a contract underway to determine the national need (industry, academia and Government) for trained toxicologists and to project the supply. Supply data is being obtained by making a survey of all institutions with training programs in toxicology. The demand for trained toxicologists is being obtained by a comprehensive survey of employers of toxicologists in all three sectors of the economy. The demand will be defined in terms of degree types and experience, estimates of future needs and types of special toxicology training required.

It should be noted that the increasing demand for toxicologists is not confined to the United States. Other "free world" countries are competing for US trained toxicologists as more laws requiring toxicology are enacted in these countries.

Within the overall field of toxicology, professionals in certain specialties such as metabolism/pharmacokinetics, pharmacodynamics, inhalation toxicology and immunology are in shorter supply than general toxicologists. Throughout the discipline there is an acute shortage of individuals with at least seven years experience.

Two additional supply and demand studies (Developmental Planning and Research Associates, Inc. and ICF, Inc. 1980, ICF, Inc. 1980) have concluded that the availability of experienced toxicologists and pathologists is the limiting factor in designing, conducting and interpreting AMTR.

Veterinary Pathologist

The most critical constraint on AMTR testing at the present time appears to be the availability of qualified veterinary pathologists. For most regulatory requirements Board Certified Veterinary Pathologists must supervise the pathology and perform certain phases of it.

The American College of Veterinary Pathologists (ACVP) reported 512 practicing members in the United States as of March, 1980.

Board Certification requires licensure as a Doctor of Veterinary Medicine and a minimum of five years of professional experience. Three of these five years are expected to be in a research setting, with two years practical experience in the field in which Certification is sought. All of the five years of experience are to be under the supervision of a Board Certified Veterinary Pathologist. Over the last five years an average of 70 pathologists have taken the Board Certification examination each year. Only about 30 percent of those taking the exams each year pass and receive Board Certification. There is virtually no entry of foreign-trained veterinary pathologists into the US.

The ACVP reports an increase in the number of applicants for Board Certification in the last two years. However, this increase, to about 100 applicants annually, will not mitigate the shortage of Board Certified Veterinary Pathologists over the next decade. It is important to note that of Board Certified Pathologists available, less than 140 are employed in contract or sponsor laboratories. The majority are teaching, in research, in the military, or with drug firms.

Competition for Scarce Personnel Resources

Competition for scarce personnel resources can be addressed by effective recruitment of personnel and retention of personnel once they've been hired. Another way to avert or minimize the problem is by reducing or eliminating the requirement for the scarce resources. This approach is applicable to an AMTR facility that can select its testing as a function of the availability of personnel, which is not the case for the proposed facility. This is a closed loop problem, however, because personnel that are in scarce supply for the AMTR facility will also tend to be in scarce supply nationally. Therefore, other performance mechanisms are not likely to be readily available to the Army to satisfy these requirements.

Competition for personnel can be enhanced by using a combination of the following techniques:

1. Compensation. Compensation is an important factor. It needs to be addressed on a continuing basis, not only during the initial salary offer. Non-salary compensation and deferred compensation are critical aspects of the compensation package. Tailored benefits packages are attractive, in that they enable each employee to buy benefits from a list.
2. Location. The San Francisco Bay Area is one of the most attractive environments in the United States from a quality of life standpoint if cost of living is offset by sufficient compensation. The San Francisco Bay Area is a positive feature in competing for scarce personnel resources, particularly for higher pay grade professionals.
3. Professional Environment. The professional environment is probably the most important factor in competition for scarce resources if compensation is competitive. Included in the professional environment are such factors as the type and quality of work that is being performed, giving key personnel an opportunity to participate in research activities that are gratifying and freeing professionals from administrative tasks, as well as providing excellent support. It is also important that the professionals be provided with opportunities to publish, attend conferences and receive special training. Their colleagues at all levels must be of high caliber. A relationship with a university to enable adjunct appointments may be attractive. Key professionals should influence the type of work that is performed in the facility and participate in the planning for the activity.
4. Ownership. The possibility of providing key professionals ownership opportunities in the contracting corporation is a special compensation consideration.
5. Training. An active postdoctoral program that brings individuals to the AMTR facility for training, and uses the training opportunity to recruit them to the permanent staff, can enhance the number of qualified personnel.

Comparative Compensation Analysis

Table 3 provides a comparative compensation analysis for 12 positions expected to be included within an AMTR facility. The findings of a special compensation study conducted by Towers, Perrin, Forster and Crosby (1981) for these positions determined that civilian and Government compensation rates are comparable for most positions. It was determined, however, that Government rates are higher for two positions, Organic Chemist and Information Specialist, but lower for the Director of Toxicology, Pathologist, Laboratory Technician and Animal Caretaker.

TABLE 3 COMPENSATION COMPARISON FOR PRIVATE SECTOR AND GOVERNMENT

Position	Degree	Years of Experience	Recruiting Area	Annual Compensation (to nearest \$100 as of 3/81)		
				Civilian	Government	
					GS	Wage Rate
Management						
• Director of Toxicology	Ph.D.	15	National	\$46,400 - \$65,000	\$44,500 - \$52,000	
• Facility General Manager	MBA	15	National	37,000 - 53,500	44,500 - 52,000	
Professionals						
• Analytical Chemist	Ph.D.	7	National	26,000 - 38,000	32,000 - 49,200	
• Biochemist	Ph.D.	7	National	25,000 - 56,000	32,000 - 49,200	
• Pharmacologist	BS	7	National	27,000 - 41,000	32,000 - 49,200	
• Organic Chemist	Ph.D.	7	National	27,700 - 28,000	32,000 - 49,200	
• Pathologist	Ph.D.	7	National	55,000 - 90,000	32,000 - 49,200	
Technicians						
• Information Specialist	MS	5	National	14,400 - 19,800	22,500 - 29,200	
• Computer Programmer	BS	5	SF Bay Area	19,000 - 24,000	—	\$18,400 - \$24,500
• Lab Technician (Chemistry)	BS	5	SF Bay Area	16,600 - 24,000	—	14,200 - 19,500
• Animal Caretaker	—	—	SF Bay Area	18,600 - 24,000	—	14,200 - 19,500
Clerical						
• Secretary	—	—	SF Bay Area	13,500 - 16,100	—	14,200 - 16,500

A study performed by the Compensation Institute examining geographic salary differentials provided information for San Francisco in and other selected cities in comparison with national average figures. In this study, San Francisco had a differential of +13% at the minimum wage and +12% at the top sample salary, in comparison to the national average salaries. Differentials for the Washington, DC area were +12% at the minimum salary and +7% at the top sample salary. In contrast, Raleigh, North Carolina had a minimum salary equal to the national salary and a top sample salary of 13% less than the national top sample salary. These data did not relate specifically to the personnel types required for an AMTR facility but indicate that salary differentials in general in San Francisco are approximately 12% above the national average at all salary levels.

Key Relocation Decision Factors

The relative importance of relocation decision factors is an individual matter. Marital status, age, education, and family size are likely to greatly impact an employee's willingness to relocate. Nevertheless, certain decision factors seem to be addressed by a majority of individuals and their families asked to relocate. Relocation Consultants, experts in relocation within the San Francisco Bay Area, indicated that housing is a priority issue in almost all relocation cases within the San Francisco Bay Area. Many employees accept positions in San Francisco contingent upon their ability to find and finance suitable housing.

While the relative importance of other decision criteria may vary, the following list represents Relocation Consultants' experienced evaluation of the criteria, other than housing costs, that are most often cited by a family of four (two adults, two children) for a middle management (\$35,000-\$45,000) position:

- Career Opportunities
- Spouse's Career
- Quality of Schools
- Cost of Living Factors (Other than Housing)
- Quality of Life
- Commute Time/Methods
- Time and Amount of Relocation Assistance Provided

San Francisco as a Personnel Factor

The following considerations were examined:

- Work Environment
- Service Orientation
- Work Force
- Housing Cost
- Public Transit
- Medical Costs
- Schools
- Leisure

These are not presented in order of criticality. Compensation and personnel supply and demand are not dealt with as personnel considerations in this section, because they are dealt with in separate sections of this Report. A brief summary of the highlights of each are follows:

Work Environment

- Desirable Climate
- Naturally beautiful surroundings
 - San Francisco Bay
 - Nearby mountains
- Historical interest
 - Gold Rush country
 - Waterfront

Service Orientation

- Manufacturing companies leaving the city
- San Francisco is a "headquarters" city
- Large concentration of services

Workforce

- Total labor force 326,000
- 44.3% Female
- 11.6% Black
- 14.7% Other Nonwhite
- 12.8% Spanish American
- Rich in multiple ethnic groups

Housing Costs

- Average home value of \$126,000 in San Francisco in 1980
- Highest of cities compared
- Housing in increasingly short supply within the 7 mile square city, forcing population to reside in a five-county area

Public Transit

- Several systems available
 - Buses
 - BART
 - Ferries
- Transportation costs highest of all cities compared

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Medical Costs

- Average semi-private daily hospital room rate in July 1980 of \$214, topped nationally only by New York City and Cleveland, Ohio
- Physicians' charges not out of line with other major cities
- Overall, second highest of 4 comparison cities

Schools

- Quality of public schools within San Francisco varies
- Quality of public schools in surrounding areas also varies. Some locations are consistently high quality, some low quality and some inconsistent quality
- For employees with children, housing and schools are interrelated
- Many private, independent schools are available, but costs are on the high side
- Excellent public university and community college system: e.g., UC-Berkely, San Francisco State University, California State University, Hayward City College
- Several high quality private colleges and universities also available: e.g., Stanford University, University of San Francisco, Golden Gate University, College of Marin

Leisure

- Outdoor activities abound year round
 - Hiking
 - Jogging
 - Boating
 - Golden Gate Park
- Skiing nearby in winter
- Multiple tourist attractions
- Multiple cultural activities
 - Symphony
 - Museums
 - Lectures
 - Concerts
- Attitude of workforce is that work is one part - but not all - of life

Table 4 is a cost of living comparison for six indicators. It compares San Francisco and three other metropolitan areas (Baltimore, Maryland; Trenton/Newark, New Jersey; and Durham, North Carolina).

TABLE 4 COST OF LIVING COMPARISON^(a)

Indicator	City			
	San Francisco Bay Area	Baltimore MD	Newark NJ	Durham NC
Housing	162.3	85.4	121.8	99.8
Utilities	94.0	123.9	115.9	93.3
Transportation	112.2	104.3	110.5	100.8
Health Care	126.9	128.6	109.3	114.6
100 Items	118.8	104.1	111.3	99.9
Groceries	92.4	108.5	102.3	97.2

(a) 100 is the national average

SOURCE: American Chamber of Commerce Researchers Association.

PERSONNEL DEVELOPMENT PLAN

Compensation Policy and Analysis

Compensation Policy

This section provides an overview of the elements needed in a sound compensation policy, including salary ranges, job evaluation, performance appraisals, merit salary policy and communications with employees. All of these elements are interrelated and relate primarily to salary administration. Each will need to be expanded considerably prior to establishing an AMTR facility, especially in view of the potential conflicts between Government and non-Government employees if they are co-located in the same facility. The objectives of the salary administration policy are to:

1. Attract and retain the services of competent, fully qualified employees by providing fair and equitable compensation to them.
2. Provide incentives for employees to improve their job performance and encourage them to aspire for promotions.
3. Ensure that salaries are competitive and in line with salary levels that prevail among major competitors.

Salary Ranges

Salary structures should satisfy the following criteria:

1. Salary ranges represent the current "market value" for each responsibility level
2. Range minimums represent realistic starting ranges for each responsibility level
3. Range spreads (differences between minimums and maximums) have sufficient scope to recognize differences in job performance among individuals in the same salary grade.

To gauge the competitiveness of salaries, surveys of salaries paid by other employers for jobs with comparable levels should be continually performed and analyzed, and adjustments should be made as required. Revisions should be made to salary grade ranges, although this would not alter the grades to which jobs are assigned, nor would it result in automatic changes in individual salaries.

Job Evaluation

Job evaluation is the process of systematically analyzing the duties and responsibilities of a position in order to determine its relative value to the employer. After evaluating a job, it can be classified and a salary grade may be established that is internally equitable with other jobs within the company and externally competitive with salaries currently paid by other major employers for jobs with comparable levels of responsibility.

Job evaluation is concerned with the content of a position and not with the assessment of the individual's performance or with the setting of the individual's salary.

Job evaluation is a critical part of salary administration, since employee salaries will ultimately be affected by their classification and their salary grade assignment. For the salary program to work successfully, position evaluations must be kept current, and consistent procedures must be followed in doing so. The basic function of the position must be fully understood. Therefore, position descriptions are the basis for evaluating each position.

The duties and responsibilities itemized by incumbents are reviewed and edited by supervisors, and any additional information which clarifies or explains the overall function of the position is documented. Evaluations must take into consideration current duties and responsibilities and evaluate the job, not the person.

Performance Appraisal

The primary goal of the performance appraisal process is to foster growth and evaluate the performance on the part of each individual employee. The secondary goal is to furnish a sound and consistent basis for proper salary administration. Performance appraisals can be conducted separately from the salary determination process. The performance appraisal program should be designed so that the expected contribution of each individual is clearly and concisely identified and that the achievements of the individual are periodically reviewed against the performance criteria.

Establishing Job Objectives and Standards of Performance

It is essential to develop definitions of each specific job at the AMTR facility and to carefully outline the expected standards of performance that are to be applied. The personnel department should participate in ensuring that job objectives and standards of performance are adequately described. Job descriptions should include the major goals and requirements of the position, the relationships (both vertically and horizontally with other personnel) and accountability relative to money, people and time. Standards of performance include meeting operational objectives, planning (necessary to achieve job objectives), relationships, self-development and development of subordinates.

In order to conduct an objective performance appraisal, the employee's actual performance must be measured against the standards for the position. This requires position performance standards that are complete, accurate and current. Various rating systems (numerical scores or qualitative terms) can be utilized. The proper and timely execution of the process is more important than the format or rating system used.

It is important that the employee be advised of the results of his appraisal by his immediate supervisor at a private meeting. The employee should be provided a copy of the performance standards document at the meeting. The

specific weaknesses and strengths of the employee should be identified and an overall performance rating provided. An employee development plan is an important part of the appraisal, and it should be drawn up to assist the employee in improving and increasing performance on the present job or preparing for a promotion in the future. Appraisal should be performed at least annually.

Salary Adjustments

The overall types of salary adjustments include merit increase, promotional increase, salary decrease and economic increase. Compensation policy has merit salary increase policies as one of its key elements. It is a matter of policy that these increases are provided only in recognition of meritorious performance and are not to be utilized to compensate for economic factors and promotions.

A merit increase is an increase in salary within the salary grade or job classification given strictly for individual merit accordance with the guidelines for established performance review categories.

Promotional increase in salary is granted to an employee when reclassification to a higher graded job occurs.

A decrease in salary is made in conjunction with the reclassification to a position of lesser responsibility.

An economic increase is given in recognition of the compositive effect of increases in cost of living, productivity increases and the prevailing salary movement.

As policy, it is suggested that salary increases be not less than 7% or more than 20% annually.

Communication with Employees

A sound salary administration program ensures that each employee's salary is reviewed and that a decision is made about a salary adjustment at least once a year. The program, to be effective, must be communciated to and understood by the employees. The individuals must be confident that systematic and fair review is performed. Employees should not feel that they must request salary increases.

Personnel Training

Personnel training include both long and short term, informal and formal programs. It covers training required for certification or licensure. Training may be performed in-house, at a university, a government laboratory or a manufacturer's or professional trainer's site.

Training requirements will be keyed to career development and will be included in the performance evaluation process. It is anticipated that all personnel will have the general skills required for entry level to their job. Specialized training for new equipment or new procedures will be identified when equipment is requested or Standard Operating Procedures (SOP's) are written.

Potential Conflicts Between Government and Non-Government Employees and Suggested Resolution

Table 5 provides a list of 13 of the most probable and significant conflict areas between Government and non-Government employees. The areas listed in the Table are not listed in order of severity or priority.

Presented below for each potential conflict is a short paragraph on the source of the conflict and a potential resolution (Towers, Perrin, Foster and Crosby 1981).

Required Compliance Reports

Personnel reporting requirements, e.g., EEO-1 reports and Affirmative Action Plans, may need to be met separately for Government and Contractor employees.

Potential resolution: maintain separate, parallel human resources information systems and file separate reports.

State Licensing of Professional Employees

Certain professional contractor employees may require California State licensing while comparable US Government employees may be exempt from such requirements.

Potential resolution: utilize only Contractor or Government employees in those job classes requiring state licensing; do not mix the two groups.

Recruitment

When the same position is being recruited for the Contractor and the Government, recruiting efforts (brochures, want ads, job descriptions, etc.) must clearly state differences in personnel policies. This may lead to applicants seeking only the position which has "superior" policies.

Potential resolution: utilize only the Contractor or the Government as the employer for each job class; e.g., have all applicants apply to one or the other and have all employees in a given job class employed by one or the other.

Work Week

Standard working hours may differ between Contractor facility and Government facility.

Potential resolution: establish common working hours for the GOCO facility which conform insofar as possible to those of the primary facility in which GOCO employees are located.

TABLE 5 POTENTIAL CONFLICTS BETWEEN GOVERNMENT
AND CONTRACTOR EMPLOYEES

- Required compliance reports
- State licensing of professional employees
- Recruitment
- Work week
- Time off
 - Vacations
 - Sick leave
 - Holidays
- Salary administration
- Job evaluation
- Performance appraisal
- Promotions and transfers
- Terminations and layoffs
- Health insurance coverage
- Life insurance coverage
- Retirement benefits

Time Off: Vacation

Vacation allowances may differ by job class, by length of service and by existing Contractor vs. Government policy.

Potential resolution: establish a vacation policy for GOCO employees which is consistent by job class; for those GOCO employees having prior service with the Contractor or the Government, establish an equitable process for transferring accrued vacation and vacation eligibility status.

Time Off: Sick Leave

Sick leave allowances may differ by job class, by length of service and by existing Contractor vs. Government policy.

Potential resolution: establish a sick leave policy for GOCO employees which is consistent by job class; for those employees having prior Contractor or Government service, establish an equitable process for transferring accumulated sick leave.

Time Off: Holidays

Contractor and Government may provide different holiday schedules.

Potential resolution: grant GOCO employees all holidays common to both employers and permit floating holiday scheduling for remaining number of days usually given by either employer.

Salary Administration

Contractor and Government salaries may differ for comparable positions.

Potential resolution: all employees holding each GOCO position should be employed by either the Contractor or the Government.

Job Evaluation

Pay scales for Contractor and Government employees in positions with different titles but similar duties may vary significantly.

Potential resolution: establish a formal job classification and evaluation system to ensure internally equitable job relationships.

Further potential problem: reconciling internal relationships with marketplace and Government pay rates.

Performance Appraisal

Contractor employees may be on a merit review system for pay increases while Government employees are on a step rate system based on tenure in job.

Potential resolution: maintain separate jobs for Contractor and Government; Contractor jobs receive performance appraisals linked to salary increases/decreases; Government jobs receive performance appraisals which are not related to pay action.

Promotions and Transfers

Promotion to next level job may be a problem if the Contractor is the employer for the existing position and the Government is the employer for the higher level position or vice versa.

Potential resolution: establish job group hierarchies (career ladders) for each employer; e.g., all clerical workers employed by either the Contractor or the Government.

Terminations and Layoffs

As workload and individual performance vary, terminations and/or layoffs may need to occur and different approaches to handling them by the Contractor and the Government may cause conflict.

Potential resolution: maintain termination and layoff policies by job class; each job class is employed by either the Contractor or the Government, not both.

Health Insurance Coverage

Amounts and type of coverage and employee contributions may vary by Contractor vs. Government as employer.

Potential resolution: provide supplemental insurance to bring Contractor employees to levels equivalent to Government insurance levels; alternatively, purchase separate coverage for GOCO contractor employees, or allow the two levels of coverage to co-exist.

Life Insurance Coverage

Amounts and type of coverage and employee contributions may vary by Contractor vs. Government as employer.

Potential resolution: same as for health insurance.

Retirement Benefits

Age requirements, type of plan, level of benefits and level of employee contributions may vary by Contractor vs. Government as employer.

Potential resolution: same as for health insurance.

Utilization of Pathologists

Since the availability of Board Certified Veterinary Pathologists is projected to be a limiting factor, the following approaches are presented as possible techniques to enhance utilization of pathologists:

1. Use large screen slide viewing techniques that do not require microscope viewing. This technique will require less concentration and will not tire the pathologist as quickly. Team judgement and teaching can be integrated into this approach.
2. Utilize Board Certified pathologists only for those functions that it is essential they perform.
3. Provide the Board Certified pathologist with high quality administrative assistance and clerical support to minimize these burdens.
4. Utilize para-pathologists for those tasks that they can perform.
5. Take into consideration the pathology workload when scheduling experiments to even out the pathology workload.
6. Provide peakload assistance through external contract support.
7. Consider split appointments with universities for pathologists that want to teach part-time.
8. Prepare and use standard operating procedures to provide uniform procedures.
9. Provide highly-skilled technicians to maximize use of the pathologist's time.

Applicable US and California Laws

The following is a list of the laws considered most significant to a Contractor operated AMTR facility located in California:

Federal Laws

The following is a list of the most significant federal laws:

1. Title VII of the Civil Rights Act of 1964, as amended and related guidelines on:
 - a. Discrimination because of sex
 - b. Sexual harrassment
 - c. Discrimination because of national origin
 - d. Discrimination because of religion
 - e. Employee selection
2. Age Discrimination in Employment Act (ADEA)
3. Equal Pay Act
4. Pregnancy Discrimination Act

5. Executive Order 11246
6. Section 503, Rehabilitation Act of 1973
7. Section 402, Vietnam Era Veterans Readjustment Assistance Act of 1974.

California State Laws

The following is a list of the most significant California laws:

1. Rules and Regulations of the State Fair Employment and Housing Commission
 - a. Pre-employment practices
 - b. Employee selection
 - c. Compensation (reserved)
 - d. Terms, conditions, and privileges of employment
 - e. Race and color discrimination (reserved)
 - f. National origin discrimination (reserved)
 - g. Ancestry discrimination (reserved)
 - h. Sex discrimination
 - i. Marital status discrimination
 - j. Religious creed discrimination
 - k. Physical handicap discrimination
2. California Confidentiality of Medical Information Act
3. Statutory Disability Benefits Laws

GOVERNMENT STAFFING

Government personnel are required at the AMTR facility to provide technical monitorship and contract administration. Participation in associated research or joint participation in testing is not considered in this Plan. Government regulations establish the minimum requirements that must be satisfied by the Army to fulfill its obligations relative to contract monitorship and administration. These requirements must be met. Because of the anticipated high level of activity at the AMTR and number of work assignments it will be necessary to have a contract administration team on site. It appears logical to have the Contracting Officer's representative located at the facility, as this is the practice at all other large GOCO operations contacted.

For technical monitorship, the Project Officer and his team need to provide the technical interface for all inputs to and outputs from the AMTR facility. Coordination with the military organizations (both MRDC and others) that are customers of the facility is best carried out by this technical monitorship team.

The Government staff will generate the work assignments for the Contractor, review the work assignment plans and/or proposals that are developed by the Contractor, evaluate progress and final reports developed by the AMTR facility, participate in the planning activities for the AMTR facility, and resolve problems as they occur.

The number of technical personnel and their particular disciplines will be a function of the type of toxicology work performed in the AMTR facility. The type of work, more so than the amount of work, will dictate the makeup of the Government staff. The Government staff should include an individual earmarked for product/quality assurance and individuals with expertise in each toxicology research/testing area. An Advisory Board to the Project Officer would provide an effective peer review mechanism.

The Government may be well advised to take advantage of the AMTR facility to use it for training personnel in toxicology and toxicology related disciplines. This approach will help develop MRDC as a "smart buyer" and indirectly help establish a "corporate memory" by building the in-house talent needed for pre- and post-testing aspects as part of Health Hazards Assessment.

CONCLUSIONS

A comprehensive Personnel Plan is vital to the establishment and maintenance of a high quality AMTR facility. Personnel represent a critical resource that will limit the facility's capabilities. The San Francisco area has positive and negative factors relative to personnel; however, the positive factors can be used to enhance personnel recruitment and retention. A sound technical and managerial plan are critical to maintaining an effective work force. Contractor-operated performance is a viable solution from a personnel standpoint if the Contractor has a long-term contract, flexibility in personnel activities and mission continuity.

RECOMMENDATIONS

The following recommendations are made as a result of the Personnel Plan:

1. A careful, well thought out strategy must be developed and implemented for the facility to compete effectively for scarce personnel resources.
2. The size of the Government management staff should be kept to a minimum because of the Federal Service and Military personnel ceilings.
3. The mission of the facility should include more than testing to enhance personnel recruitment and retention.
4. The contract should run for as long a period as possible to enhance recruitment.
5. The Contractor should use innovative approaches to attract and retain high quality personnel, particularly for scarce personnel resources.
6. At least six months' time should be allocated for personnel recruitment actions for the hires required to perform the first operational tests.
7. The Advisory Board should be considered as a peer review mechanism.
8. The Army should use the facility as a training site to develop a "smart buyer" and help establish the in-house team needed for Health Hazards Assessment.

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APPENDIX 1

Education and Experience level
Recommendations and Major Responsibilities
for Selected AMTR Personnel.

The following recommended education and experience levels are estimates of the average level of personnel an AMTR facility should recruit and be staffed with to perform all types of testing projected as potentially required in TR-477-29, AMTR Protocols/Pricing Report.

Toxicologist (Selected sub-disciplines; see Table 1 for list)

- Ph.D. in toxicology, with a minimum of 4-5 years experience in toxicology testing. Post doctoral training and experience in speciality field.

Veterinary Laboratory Animal Officer - D.V.M.; Board-certified or eligible for certification by the American College of Laboratory Animal Medicine with a minimum of two years of experience in laboratory animal medicine. This individual oversees all animal husbandry and veterinary care and performs complete physical examinations.

Compound Preparation Technician - B.S. degree in chemistry or life science and a minimum of 1-3 years of experience in analytical or testing laboratories. This individual is responsible for the preparation of all test substances for dosing (e.g. dietary incorporation, dosing solutions, etc.).

Animal Technician - B.S. degree in life sciences or equivalent experience in animal testing laboratories. AALAS-certified or eligible for Animal Technician. Experienced in technical skills of dosing, observations, necropsy, and data collection.

Animal Caretaker - entry-level position. This individual is responsible for providing general animal care and husbandry services, including cage cleaning, feeding, and watering.

Necropsy Supervisor - D.V.M. or equivalent certification or experience in laboratory animal surgery and necropsy. This individual oversees all necropsies and supervises necropsy technicians.

Necropsy Technician - A minimum of 1-2 years experience in animal testing laboratories and trained in necropsy and tissue trimming techniques.

Histology Supervisor - ASCP - certified Histotechnologist with a minimum of 3 years experience in histologic processing of tissues. This individual oversees all histology services and the production of slides for pathologic evaluation.

History Technician - certified or eligible for certification by the American Society of Clinical Pathology (ASCP) with a minimum of 1-2 year experience in histology techniques.

Veterinary Pathologist - Board certified or Board eligible doctoral-level pathologist with a minimum of 3 years of experience in veterinary pathology of laboratory animals. This individual supervises all scheduled necropsies and performs all microscopic examinations of tissues.

Technical Editor - B.S. or M.S. in life sciences, with a minimum of 3 years experience in technical writing and toxicological testing. This individual oversees the production of all reports of toxicity studies.

Computer Programmer - B.S. in computer science or equivalent experience. This individual develops and operates all computer programs used for data collection, analyses, and tabulation.

Computer Coder - a minimum of one year experience in keypunching.

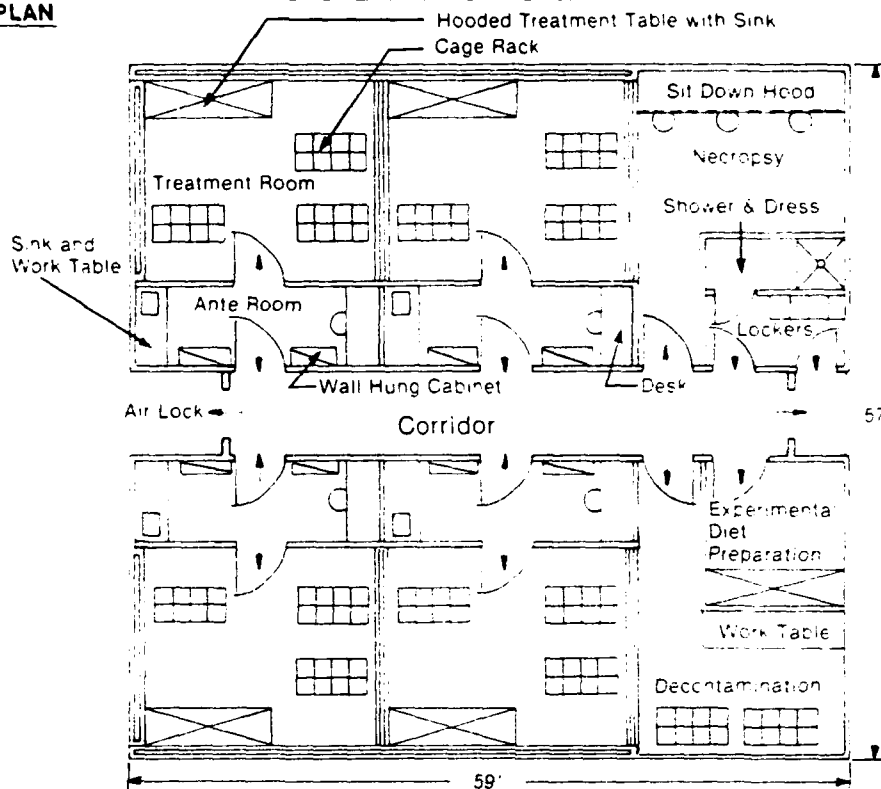
Report Typist - responsible for all technical typing involved in the production of final reports.

Secretary - provides secretarial support to scientific and managerial personnel.

MAMMALIAN TOXICOLOGY FACILITY MODULE DESCRIPTION

Life Systems

FLOOR PLAN



SCALE: 1" = 15'

CONSTRUCTION INFORMATION

Dimensions: 59' x 57' Ft.
 Area: 3,363 Sq. Ft.
 Ceiling Height: 8' x 9' x 13'
 Air Flow: 7,500 CFM Variable
 Air Changes/Hour: 15
 Floor Drains: ☒ Capped ☐ Flushing ☐ Other
 Water: ☒ Hot ☒ Cold ☐ None ☐ No ☐ Make-up
 Central Vacuum Cleaning: ☒ Yes ☐ No
 Local Exhaust Filtration: ☒ Yes ☐ No
 Epoxy Coated: ☒ Walls ☒ Floors ☒ Ceilings
 Sprinklers: ☐ Yes ☒ No ☐ Halon ☐ Optional
 Timed Lighting
 Compressed Air: ☐ Vacuum: ☐ Other Gases
 Emergency Shower/Eye Wash

SPECIAL FEATURES/BENEFITS

1. Can test four chemicals simultaneously.
2. Double walls for air pressure control in rooms and sound isolation.
3. Compatible with highly hazardous tests:
 - Ante room isolates corridor
 - Local diet preparation
 - Local necropsy
 - Local cage/rack decontamination

SPECIAL ASSUMPTIONS

1. Tests of highly hazardous materials must be performed.
2. Safety considerations require local necropsy and diet preparation.

COST ESTIMATE

	Total \$(000)	Resulting \$/Sq. Ft.
General Construction	54	16
Heat, Vent., Air Cond	34	10
Electrical	31	9
Sanitary	16	5
Equipment	104	31
Total	239	71

TITLE

Acute Oral Exposure Area, Rodent

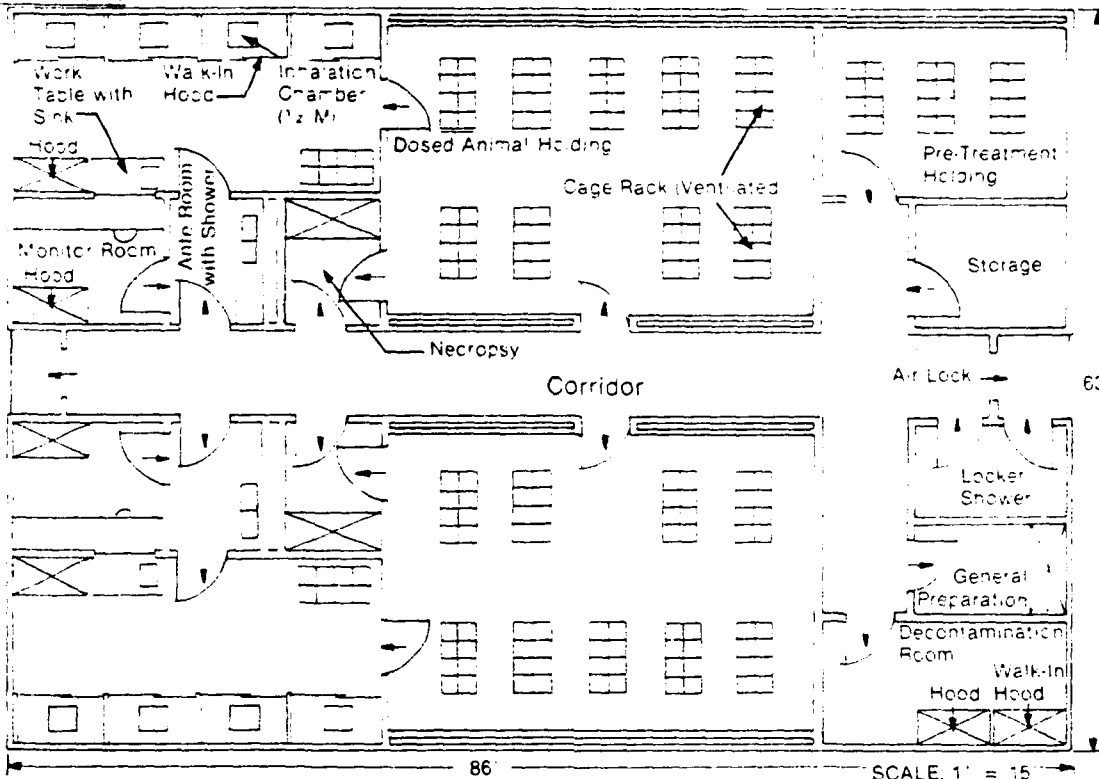
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MAMMALIAN TOXICOLOGY FACILITY MODULE DESCRIPTION

Life Systems

FLOOR PLAN



CONSTRUCTION INFORMATION

Dimensions: 86 x 63 Ft.
 Area: 5,418 Sq. Ft.
 Ceiling Height: 8' x 9' x 13'
 Air Flow: 12,000 CFM Variable
 Air Changes/Hour: 15
 Floor Drains: ☒ Capped ☐ Flushing ☐ Other
 Water: ☒ Hot ☒ Cold ☐ None ☐ No ☐ Make-up
 Central Vacuum Cleaning: ☒ Yes ☐ No
 Local Exhaust Filtration: ☒ Yes ☐ No
 Epoxy Coated: ☒ Walls ☒ Floors ☒ Ceilings
 Sprinklers: ☐ Yes ☒ No ☐ Hail ☐ Optional
☒ Timed Lighting
☐ Compressed Air ☐ Vacuum ☐ Other Gases
☐ Emergency Shower/Eye Wash

SPECIAL FEATURES/BENEFITS

1. Can test two chemicals simultaneously.
2. Separate dosed animal holding areas avoids cross-contamination.
3. Walk-in hoods provide safe maintenance of chambers from all sides.
4. Compatible with highly hazardous tests:
 - Ante room permits personnel decontamination
 - Local necropsy
 - Local decontamination

SPECIAL ASSUMPTIONS

1. Desirable to have local pre-test animal holding area.
2. Desirable to have local necropsy.

COST ESTIMATE

	Total \$ (000)	Resulting \$/Sq Ft
General Construction	124	23
Heat, Vent., Air Cond.	74	14
Electrical	71	13
Sanitary	38	7
Equipment	396	73
Total	705	130

TITLE

Acute Inhalation Exposure Area, Rodent

NO.

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F-650 (2/15/81)

DISTRIBUTION LIST

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